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ASSESSMENT OF CLINICAL PHARMACIST INTERVENTION IN TERTIARY CARE TEACHING HOSPITAL OF SOUTHERN INDIASATISH KUMAR BP¹, PRASANNA DAHAL^{1*}, RAJESH VENKATARAMAN¹, PRASHANT CHANDRA FULORIA¹,¹Department of Clinical Pharmacy, AH & RC, SAC college of Pharmacy, B.G Nagara, Karnataka, E-mail: Prince_prasanna@hotmail.com

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ABSTRACT

Introduction: Drug-related problems (DRPs) are frequent in hospitalization where multiple changes in patient's medication regimens and lack of continuity of care may be accompanied. **Objectives:** To assess clinical pharmacist intervention on the drug related problems in medicine ward of tertiary care hospital. **Method:** It was a prospective, observational and interventional study carried over a period of 4 months. **Results:** A total of 240 patients were followed out of which 49 patients were intervened for having one or more drug related problems. Male (61.30%) predominance was noted over females (38.70%). Drug related problems were more commonly seen in patients aged above 60 years, (53.10 %). A total of 71 drug related problems were identified. Most of the DRP observed in the study resulted from the inappropriate drug dosing problems (25.35%) followed by drug selection (23.94%). Majority of the clinical pharmacist recommendations were on drug discontinuation (29.58%) and drug doses change (22.53%). Moderate significance of DRPs were noted high (47.89 %), whereas (39.44 %) were minor and (12.67 %) were major. The acceptance rate of intervening clinical pharmacist recommendation and change in drug therapy was found to be high (70.59%). **Conclusion:** Clinical pharmacist involvement in inpatients care can significantly help to identify, resolve and prevent the DRPs among patients in the hospital. The study concluded that the clinical pharmacist have a significant role in patients care at hospital.

Keywords: Drug related Problems (DRPs), Clinical Pharmacist, Intervention, Drug therapy,**INTRODUCTION**

A drug-related problem (DRPs) is defined as 'an event or circumstance involving drug therapy that *actually or potentially* interferes with desired health outcomes. An actual problem has resulted in clinical manifestations like adverse drug reaction or therapy failure due to incorrect dosage. A potential problem is not manifest, but if left unresolved, it may lead to drug-related harm to the patient ¹.

Drug-related problems include medication errors (involving an error in the process of prescribing, dispensing, or administering a drug, whether there are adverse consequences or not) and adverse drug reactions (any response to a drug which is noxious and unintended, and which occurs at doses normally used in humans for prophylaxis, diagnosis or therapy of disease, or for the modification of physiological function). Medication error rates found in observational studies are reported to vary between 1.7 and 59%, in which prescribing errors are reported to be 0.3-2.6%. Medication errors also frequent cause for adverse drug reaction. Incidences of ADR reported in studies published since 1991 vary between 1.9 and 37.3% ². Studies estimated that ADEs account for approximately 5% of all hospital admissions, occur during 10-20% of hospitalizations and are responsible for 7-9% of hospitalization days. Incident ADEs cause by medication errors were observed in 1 out of 250 patients and accounted for approximately 6% of ADEs and accounted for 30% of ADE-related hospital admissions ³.

Drug-related problems are frequent in hospitalization where multiple changes in patient's medication regimens and lack of continuity of care may be accompanied. Problems associated with drug use are many and includes inappropriate medication prescribing, discrepancies between prescribed and actual regimens, poor adherence, drug interactions, inappropriate use, patients monitoring and inadequate surveillance for adverse effects etc. Drug related problems may leads to reduced quality of life, increase hospital stay, overall increase health cost and even increase risk of morbidity and mortality ⁴⁻⁶. However, studies shows that majority of Drug-related problems (50-80%) are often preventable, and pharmaceutical services can reduce the number of ADRs, the length of hospital stays, and the cost of care ¹.

A clinical intervention is the process of a pharmacist identifying, and making a *recommendation* in an attempt to prevent or resolve, a DRPs. Pharmacist intervention outcomes include health related

quality of life, patient's satisfaction, medication appropriateness, adverse drug reaction and economics. Studies have shown that clinical pharmacists effectively can identify, solve and prevent clinically significant drug-related problems and has positive impact on patient's outcomes like improved health and economic outcomes, a reduction in medicine-related adverse events, improved quality of life, and reduced morbidity and mortality ⁷⁻¹⁰.

Several studies conducted in developed countries shows the high evidence of drug related errors among hospitalized patients ^{6, 11-13}. The studies related to prevalence of drug related problems is lacking in India however some of the studies conducted Indian hospital shown much evidences of drug related problems and also reflects positive impact of pharmacist intervention on reducing drug related errors and overall patients care ¹⁴⁻¹⁷.

The purpose of this study was to determine and evaluate the relevance of clinical pharmacist intervention in medicine wards and subsequently benefit of pharmacist involvement in multidisciplinary health care team during inpatients care.

MATERIAL AND METHODS

The prospective, observational and interventional study was conducted for the period of four months at Sri Adichunchanagiri Hospital and Research Center, B.G.Nagara which is 1050 bedded rural tertiary care teaching hospital of southern India. All inpatients of either sex of any age undergoing treatment on the General medicine wards of the hospital will be taken for the study. An exclusion criterion involves patients undergoing treatment less than one day of hospital stay. Pharmacist routinely monitors the patient's drug therapy during their hospital stay. A working principle consists of patient's data collection, pharmaceutical care evaluation and participation in ward rounds. Data was collected from inpatients case sheets (case records, medication chart and laboratory reports etc) and screened for any drug related problems (such as inappropriate drug selection, dosing, compliance, untreated condition, monitoring needs, drug use, ADRs etc). All intervention made by the attending pharmacist was preceded with consultation with academic clinical pharmacist. The relevant issues related to drug related problems was notified and discussed with the physician. Drug involved in DRPs, types of DRPs, potential issues and the clinical significance level of DRPs, recommendation provided and the acceptance level of physician for the particular intervention,

whether or not there was change in drug therapy was noted and recorded in clinical pharmacist interventional record form suitably designed for the study. The study data was analyzed by using suitable statistic procedures in Microsoft excels 2007. The results were analyzed in average, number and percentage.

RESULTS

A total of 240 patients were followed out of which 49 patients were intervened for having one or more drug related problems. Among

49 patients, the males were 30 (61.30 %) predominance over females 19 (38.70 %). Furthermore almost all the intervened patients were above the age group greater than 30 years while patients above 60 years of age shows more number of DRPs 26 (53.10 %) than age group between 31-60 i.e. 23 (46.90%). The details of patients demographic along with other factors influencing DRPs like co-morbidity, number of drugs received on admission per patients and numbers of DRPs identifying per patients intervened are shown in Table 1.

Table 1: The demographic details and characteristic of the patients

| Details | | Number (%) n= 49 |
|--|--------------|------------------|
| Gender | Male | 30 (61.30) |
| | female | 19 (38.70) |
| Age (years) | Less than 30 | 0 (0) |
| | 31-60 | 23 (46.90) |
| | Above 60 | 26 (53.10) |
| Co-morbidity | Nil | 17 (34.69) |
| | 1 to 2 | 23 (46.94) |
| | 3 to 4 | 8 (16.33) |
| | >4 | 1 (2.04) |
| Number of drugs received on admission per patients | 1-5 | 16 (32.65) |
| | 6-10 | 27 (55.10) |
| | >10 | 6 (12.25) |

A total of 71 drug related problems were identified from 49 patients intervened during the study period, in which, 1 DRPs was found in 33 (67.35%) patients, 2 DRPS in 12 (24.49%) patients and 3 DRPs in 4 (8.16%) patients respectively. The types and number of drug related problem identified were characterized as shown in Table 2:

Table 2: Types of Drug related Problems Identified (n=71)

| Types of Drug Related Problems (DRPs) | | No. of DRPs | Total Number | Percentage (%) n=71 |
|---------------------------------------|--|-------------|--------------|---------------------|
| Improper Drug selection | Drug /therapeutic Duplication | 9 | 17 | 23.94 % |
| | No Drug prescribed but clear indication | 1 | | |
| | Drug prescribed but no clear indication | 7 | | |
| Compliance problems | Non-adherence | 3 | 3 | 4.22 % |
| | Prescribed dose high | 12 | | |
| Inappropriate Dosing | Incorrect or unclear dosing instructions | 3 | 18 | 25.35 % |
| | Condition not adequately treated | 4 | 4 | 5.63 % |
| Under treated | | | | |
| Monitoring need | Laboratory monitoring | 3 | 4 | 5.63 % |
| | Non-laboratory monitoring | 1 | | |
| Interaction | Drug-Drug interaction | 10 | 15 | 21.12 % |
| | Drug Disease interaction | 5 | | |
| Improper Drug use | Drugs not taken/ administered | 1 | 1 | 1.40 % |
| Toxicity and Adverse reaction | Toxicity apparent | 1 | 9 | 12.67 % |
| | Side effects/ ADR present | 8 | | |

A total of 68 recommendations were made to the physician by the clinical pharmacist for 71 Drug therapy problems. The type of recommendation provided by the attending clinical pharmacist is shown in Table 3 below.

Table 3: Clinical Pharmacist Recommendation

| Types of Recommendation | Number (n=71) | Percentage (%) |
|-----------------------------------|---------------|----------------|
| Drug Doses change (dose decrease) | 16 | 22.53 % |
| Drug change | 7 | 9.86 % |
| Drug discontinuation | 21 | 29.58 % |
| Drug addition | 5 | 7.04 % |
| Dose schedule/frequency change | 4 | 5.63 % |
| Duration change | 3 | 4.23 % |
| Appropriate administration | 1 | 1.41 % |
| Drug monitoring need | 7 | 9.86 % |
| Others | 4 | 5.63 % |
| NO RECOMMENDATION | 3 | 4.22 % |

The significance level of intervention was analyzed based on 3 criteria minor, moderate and major. Out of 71 drug related problems, 28 (39.44 %) were minor, 34 (47.89 %) were moderate and 9 (12.67 %) were major. The level of significance of drug therapy intervention made is shown in Table 4.

Table 4: Significance Level of DRPs

| SIGNIFICANCE LEVEL | NUMBER (%) n= 71 |
|--------------------|------------------|
| MINOR | 28 (39.44 %) |
| MODERATE | 34 (47.89 %) |
| MAJOR | 9 (12.67 %) |

Minor: Problems requiring small adjustments and optimization to therapy, which are not expected to significantly alter hospital stay, resource utilization or clinical outcome.

Moderate: Problems requiring adjustments, which are expected to enhance effectiveness of drug therapy producing minor reductions in patient morbidity or treatment costs.

Major: Problems requiring drug intervention, expected to prevent or address very serious drug related problems, with a minimum estimated effect on reducing hospital stay by no less than 24 hrs¹⁴

Out of 68 recommendations concerning drug related problems 48 (70.59%) of the case suggestion were accepted and therapy was changed, while in 13 (19.12%) of cases suggestion were accepted but therapy was not changed where as 7 (10.29%) neither suggestion were accepted nor therapy was changed. The result of clinical pharmacist recommendations is shown in the Table 5.

Table 5: Result of interventions

| Results | Number (n=68) | Percentage (%) |
|--|---------------|----------------|
| Suggestions accepted and therapy changed | 48 | 70.59 % |
| Suggestions accepted but therapy not changed | 13 | 19.12 % |
| Neither suggestions accepted nor therapy changed | 7 | 10.29 % |

DISCUSSION

Clinical pharmacy services in hospital are not a novel concept but in context of India, it is a recently emerging discipline. With the view of expanded roles and services of the clinical pharmacist in providing improved patients care in hospital we carried out this study and assessed the clinical pharmacist-initiated changes in patient's drug therapy and prevention of drug related problems in medicine inpatient of rural tertiary care teaching hospital.

In this study, the incidence of drug related problems were higher in males than in females. This observation is in contrast with the demographic details of study conducted by Alagiriswamami et al.,¹⁴ cited a predominant of males over females. The incidence of drug related problems were found high among patients of age above 60 year as compared to the age group between 31-60 years. These results might be due to multiple drug regimens owing to their multiple co-morbidity and age related changes in pharmacokinetics and pharmacodynamics in elderly patients. Furthermore, majority of patients have one or more co-morbidities and also received more than 6 drugs during their admission thus increasing the likelihood of developing the drug related problems. Studies have shown that the number of drugs at admission and the number of clinical/pharmacological risk factors were both independent risk factors for the occurrence of DRPs⁴.

The most common types of drug related a problem was inappropriate drug dosing (25.35 %). This observation is in contrast with the study carried out by Gurumurti Parthasarathi et al.,¹⁷ and Mangasuli et al.,¹⁶ in India, in which inappropriate dosing accounted for the highest about 31 % in both the studies. Several studies conducted abroad also had recorded the drug doses problems as most common DRPs observed during intervention^{4, 10, 19, 20}. In this study high dose of prescribing was the major drug dosing issues, followed by incorrect or unclear dosing instruction and inappropriate duration. During the study, problems requiring drug dosing adjustment were mostly observed in the situation where renally excreted drugs are used in patients with reduce or impaired patients renal function, where adjustment of dose is required based on creatinine clearance and body mass; dose adjustment of narrow therapeutic drugs like digoxin, theophylline in geriatric patients. Incorrect or unclear dosing instructions were found in single case which may be due to lack of physician awareness and stress during work. Inappropriate duration was identified in some cases of antibiotics and anti malaria drug use. This was found possibly be due to the presence of resistant infection and poor patient's medication adherence.

Drug selection problems was the second most cause of drug related problems. This finding coincides with the study conducted by Gurumurti Parthasarathi et al.,¹⁷ as the second most common cause of DRPs, however, differs from the study conducted by Alagiriswami

et al.,¹⁴ and Ganachari et al.,¹⁵ where in drug use without indication and improper drug selection was the most frequent cause of DRPs. Drug selection problems had been identified in significant number in interventional studies inside hospital conducted abroad^{13,20}. The common drugs that accounts for drug or therapeutic duplication in this study involves NSAIDs, antibiotics of same therapeutic class or categories, xanthenes derivatives such as theophylline, aminophylline etc. others include unnecessary antibiotics, NSAIDs, acid secretory inhibitors prescribed, drugs prescribed with no laboratory evidence or empirical prescribing. This higher evidence of improper drug selection may be due larger number of drug formularies available in market, lack of standard treatment protocols and delaying of laboratory investigation reports.

Drug Interaction accounted for third most common cause of Drug related which incorporates drug- drug interaction and drug- disease interaction. Few examples of drug-drug interaction identified in the study involve drug interaction between digoxin and amiodarone, digoxin with calcium channel blockers, diuretics and corticosteroids; drug interaction with sucralfate etc. Common drug disease interaction involves β -blockers in asthma or COPD which exacerbate bronchoconstriction, non selective β -blockers in diabetes that mask hypoglycemic alarms, calcium channel blockers in congestive heart failure which leads to worsening of condition due to negative inotropic effect on heart etc. This occurrence of drug interaction may be related with lack of physician knowledge about drug pharmacodynamic/ pharmacokinetics properties, lack of patients past medication and medical history determination etc. Drug interaction is major factor that might cause ADR, therapeutic failure and drug related harm to patients²¹.

In our study 12.67% of total DRPS were identified as adverse drug reaction, these finding were comparatively higher in contrast with finding of some previous Indian studies^{15, 17}. Examples of some ADR identified in our study involves digoxin toxicity due to increase dose, anti coagulants induce hematuria, drug induce rashes, vomiting and headache etc. Medication errors are regarded as the frequent cause of adverse drug events that accounts for about 5% of all hospital admission and occurs in about 10-20% of hospitalizations³.

In this study, types of other drug related problems had minority of occurrence which involves compliance problems contributed by patients non adherence, it was due to economic constraints of the patients that leads to non-procurement of prescribed drugs or reluctance of patients to take prescribed drugs. Undertreated condition accounts, generally because failure of physician to focus on minor patients un-complaint conditions like presence of anemia while treating other conditions in patients. Monitoring problems are mainly contributed due to patients underlying pathology and impaired hepatic or renal function.

Most of recommendations made were drug discontinuation 29.58% followed by proper drug doses change 22.53 %. These finding correlates with the observation made in other study were the drug discontinuation or cessation was the most frequent recommendation^{14,15}. However, differs from some other Indian study where change in drug dose change was reported as most common suggestion made¹⁷. Other recommendation includes drug change, drug addition, dose schedule/frequency change, drug duration change, appropriate administration, drug monitoring need and others.

Drug discontinuation and drug change in this study were due to improper drug selection, adverse drug reaction and clinically significant drug interactions. Addition of drug was suggested in cases like undertreated condition, no drug prescribed but clear indication whereas recommendation in proper dosing, duration change, dose schedule and frequency change was provided in the cases where dose adjustment was necessary in condition like impaired renal function, dose adjustment in geriatric and dosing need is based on body mass index. Some suggestion of dose schedule and duration changes were accounted as the reasons of drug- drug interaction e.g in case of anta-acid and sucralfate interaction with digoxin causing reduction of GI digoxin absorption, prolonged or short antibiotics drug prescription etc. Monitoring need suggestion was most commonly provided in situation were prescription of narrow therapeutic drugs like digoxin, theophylline, were made in patients with impaired renal or hepatic function and prescriptions in geriatrics patients. Others minor recommendation includes need for monitoring of patient vitals like BP, sugar, pulse etc. No recommendation was provided in the case where DRPs was the cause of patient's factors like non adherence, lack of understanding etc.

Out of 71 drugs related problems (DRPs) (39.44%) were rated to be minor, (47.89 %) were moderate and (12.67 %) were rated as major significance level of DRPs. This finding correlates with the observation carried out in several other studies in India where moderate significance of DRPs were mostly observed followed by minor and major significance levels^{14, 15, 17}.

The acceptance rate of clinical pharmacist recommendation and change in drug therapy was found to be high (70.59%). However, in 19.12 % of total recommendation the suggestion provided by the clinical pharmacist was accepted but therapy was not changed, may be because the suggestion provided was thought to be insignificant in contrast to patient's current major clinical condition by the physicians or hesitated to change the prescription immediately without close monitoring of patients. Some percentage of suggestion were neither accepted nor therapy was changed, this might be due lack of pharmacist understanding about the sophisticated physician prescribing behavior i.e prescribing decision governed by clinical experience of physician. This finding correlates with other published Indian studies¹⁴⁻¹⁷. Several interventional studies outside the countries also had recorded high acceptance rate of pharmacist intervention by the physician^{10, 12, 13, 20}.

CONCLUSION

Multiple drug regimens, co morbidities, patients age and medication errors has been found as the major cause of DRPs in our study. The study concludes that involving clinical pharmacist services in patients care can significantly helps to identify, resolve and prevent the DRPs in the hospital thereby enhancing the patient's outcomes. Furthermore, the suggestions provided by the clinical pharmacist during the intervention were well accepted by the physician thus the collaborative approach of physician and pharmacist can provide better patients care outcomes. The study stresses the importance of clinical pharmacist in health care sector and impeccable role in patients care.

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